REMARKS

The application includes claims 1-45 prior to entering this amendment.

The Examiner rejected claims 1-3, 5-7, 11-13, 19, and 22 under 35 U.S.C. § 102(b) as being anticipated by Hietanen (U.S. Patent 6,415,034).

The Examiner rejected claims 4, 8-10, 14, 20, 21, and 23-27 under 35 U.S.C. § 103(a) as being unpatentable over Hietanen as applied to claim 1 above, and further in view of Fang *et al.* (U.S. Patent 6,480,610).

The Examiner rejected claims 15-18 under 35 U.S.C. § 103(a) as being unpatentable over, and further in view of Fang and further in view of Schultz *et al.* (U.S. Patent 6,357,292).

Restriction

The Examiner issued a restriction between claims 1-27 and 44 and claims 28-43 and 45. Claims 1-27 and 44 are elected and claims 28-43 and 45 have been withdrawn.

The application remains with claims 1-27 and 44 after entering this amendment.

No new matter has been added and reconsideration is respectfully requested.

Claim Rejections - 35 U.S.C. § 102

The Examiner rejected claims 1-3, 5-7, 11-13, 19, and 22 under 35 U.S.C. § 102(b) as being anticipated by Hietanen.

Claim 1 has been amended and now recites:

an analog signal processor configured to insert in or close to an ear canal and having a first analog input for receiving a reception signal containing electrical audio signals and a second analog output for outputting a transmission signal containing electrical audio signals, the analog signal processor further comprising a piezoelectric transducer configured to convert the reception signal at the first analog input into acoustic wave vibrations in the ear canal and further configured to convert acoustic wave vibrations received from the ear canal into the transmission signal at the second analog output; and

a digital signal processor (DSP) having a first digital output coupled to the first analog input of the analog signal processor and a second digital input coupled to the second analog output of the analog signal processor, the DSP configured to measure operating characteristics of an electronic signal path of a transducer through the analog signal processor by comparing

the reception signal input into the transducer by the DSP through the first analog input with the transmission signal output by the same transducer from the second analog output responsive to the reception signal, the DSP further configured to ~~and~~ use the measured operating characteristics to filter reception signal echo from the transmission signal.

Hietanen describes a DSP 34 that outputs a signal from a speaker (ear capsule) 12. A second microphone capsule 13 receives speech signal 15' originated in the vocal cords, ear capsule signal 12' reproduced by ear capsule 12 in the auditory tube 10 and noise signal 17''. A third error microphone 14 is used for to determine noise between microphone capsule 13 and error microphone 14 (col. 4, lines 21-64).

There is no same piezoelectric transducer in Hietanen that *converts a reception signal containing electrical audio signals at the first analog input into acoustic wave vibrations in the ear canal and is further configured to convert acoustic wave vibrations received from the ear canal into the transmission signal containing electrical audio signals at the second analog output* as recited in claim 1. The speaker 12 in Hietanen only outputs non-electrical sound waves and the two microphones 13 and 14 only receive non-electrical sound waves. (See FIG. 1).

There is no single transducer in Hietanen where both the input and output of the same transducer are coupled to a DSP. Therefore the DSP 34 in Hietanen also does not *disclose a digital signal processor (DSP) having a first digital output coupled to the first analog input of the analog signal processor and a second digital input coupled to the second analog output of the analog signal processor* as also recited in claim 1.

Hietanen also does not *measure operating characteristics of an electronic signal path of a transducer through the analog signal processor by comparing the reception signal input into the transducer by the DSP through the first analog input with the transmission signal output by the same transducer from the second analog output responsive to the reception signal* as also recited in claim 1.

The electrical signal input into the speaker 12 of Hietanen can never be compared with another electrical signal output from the same speaker 12 since the speaker 12 in Hietanen does not output an electrical signal. The speaker 12 in Hietanen only outputs an acoustic ear capsule signal 12' produced in the auditory tube 10 (col. 5, lines 27-46). Because the electrical signal

path through the same transducer is never tested, Hietanen cannot measure the characteristics of that particular inductor in that electrical signal path as also recited in claim 1.

Accordingly, claim 1 is patentable under 35 U.S.C. § 102(b) over Hietanen. Claims 2-3, 5-7, and 11-12 depend upon claim 1 and it therefore follows that these calims are also patentable.

Claims 13 and 14 further clarify that the simulated transmission characteristics are for an electrical signal path that starts at the input of a first D/A converter, passes through the inductor in the analog signal processor, passes out from the same inductor through the second A/D converter, and ends at an output of the second buffer.

There is no similar electrical signal path simulated in Hietanen. The path tested in Hietanen goes from a DSP 34, to a speaker 12, over the air through a microphone 13, and back to the DSP 34. The signal pathes in Hietanen never enter and exist through a same transducer as recited in claim 13.

Claim 19 has been amended to further clarify that a filter is configured in the digital signal processor to determine *characteristics in a signal path between an input and output of a same transducer by comparing a first electrical audio test signal input into the transducer with a second electrical audio test signal output from the same transducer responsive to the first electrical audio signal.*

As explained above with respect to claim 1, Hietanen cannot simulate a signal path across a same transducer since the signals measured in Hietanen are transmitted from a speaker 12 through the air to a microphone 13. The system in Hietanen is only used for reducing external noise 17' and the noise detected between ear capsule 12 and microphone capsule 13 (col. 5, lines 27- 46). There simply is no way to determine the specific characteristics of a transducer in Hietanen because there is no test signal that is directed through such an element.

Accordingly, claim 19 is also patentable under 35 U.S.C. § 102(b) over Hietanen.

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claims 4, 8-10, 14, 20, 21, and 23-27 under 35 U.S.C. § 103(a) as being unpatentable over Hietanen as applied to claim 1 above, and further in view of Fang. The

Examiner acknowledges that Heitanen does not disclose a test signal being switched on in order to set the parameters of a second filter. However, the Examiner alleged that Fang discloses an echo cancelling algorithm that uses a second training filter.

Claim 23 recites:

simulating a combined first signal path and a second signal path different from the first signal path through the analog signal processor using a first filter located in the digital signal processor;

simulating the first signal path through the analog signal processor using a second filter located in the digital signal processor; and

subtracting an output of the first filter from an output of the analog signal processor to substantially cancel an echo component present in the output of the analog signal processor.

There are not two different signal paths tested in Fang as recited in claim 23. Fang uses a first training filter $A_i(Z)$ to model the i^{th} subband of a feedback path for microphone, receiver, ear canal resonance, and other relatively static model parameters. A second tracking filter Bi(Z) is used for tracking the variations of the same feedback path for the i^{th} subband caused by jaw movement or objects close to the ears of a user (col. 3, lines 49 – col. 4, line 13). Thus, while two filters are generated in Fang, the two filters are generated for the same signal path, and not two different signal paths as recited in claim 23.

The multiple parallel bands 560a – 560 m and filters 592 and 590 are also not separate signal paths, but simply different subbands of the same signal path (col. 3, lines 49 – col. 4, line 13). Further, nowhere in Fang is the output of the training filter subtracted from the output of the tracking filter. Refer to FIG. 8 of Fang where the output of the training filter $A_i(Z)$ is fed directly into the tracking filter Bi(Z). Also refer to column 3, line 54 of Fang where the responses of the two filters are combined together to represent the feedback path and not subtracted from each other Wi(Z) = Ai(Z) Bi(Z).

Accordingly, claim 23 is patentable under 35 U.S.C. § 103(a) over Hietanen in view of Fang.

The Examiner rejected claims 15-18 under 35 U.S.C. § 103(a) as being unpatentable over Hietanen in view of Fang and further in view of Schultz. The Examiner alleges that Schultz discloses a duplex transducer in FIG. 21 coupled to a resistive bridge 1322. The rejection is respectfully traversed.

The transducer 1320 shown in Schultz is used for sensing the pressure in a car tire (FIG.1, col. 27, lines 54-62). There is no disclosure in Schultz of a piezoelectric transducer configured to convert an electrical input voltage at the first analog signal input corresponding to the reception signal into acoustic wave vibrations for producing audio signals in the ear canal and further configured to convert acoustic wave vibrations received from the external ear canal into an output voltage corresponding to the transmission signal as recited in claim 1.

The tire pressure sensor in Schultz is non-analagous art and there is no motivation to combine the tire pressure sensor of Schultz with any type of communication device as discussed in Hietanen or Fang, much less any motivation to test electronic characters of the Schultz tire pressure sensor while in an inner ear canal.

Regardless, the bridge circuit recited in claims 15-17 is not disclosed in Schultz. There is no inductor coupled between a first and second node of the bridge circuit as recited in claim 15, much less the other capacitor and resistor elements of the bridge circuit further recited in claims 16 and 17. Accordingly, claims 15-18 are separately patentable under 35 U.S.C. § 103(a) over Hietanen in view of Fang and further in view of Schultz.

Regarding claim 44, the Examiner has not given any reasons why claim 44 is rejected. None of the art cited by the Examiner discloses an echo-canceller configured to model the variable acoustic characteristics of a piezoelectric transducer caused by the eardrum membrane and an ear canal associated with the eardrum membrane.

None of the cited art even shows a piezoelectric transducer configured to detect vibrations of an eardrum membrane caused by sound waves, <u>and</u> transmit a sound wave to the eardrum membrane, much less model the variable acoustic characteristics of the piezoelectric transducer as recited in claim 44.

CONCLUSION

For the foregoing reasons, reconsideration and allowance of claims 1-27 and 44 are respectfully requested. The Examiner is encouraged to telephone the undersigned if it appears that an interview would be helpful in advancing the case.

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Respectfully submitted,

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